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ABSTRACT

This document outlines a national action plan designed to make mathematics work for minorities. It is a result of the completion of Phase I of a project by the Mathematical Sciences Education Board (MSEB). The outline is a reflection of the collective wisdom and deliberations of some 1200 persons representative of nine groups (schools, higher education, professional organizations, communities and parental organizations, business and industry, government and the media) at six regional meetings and at the national convocation held on May 3 and 4, 1990. The framework forms the basis for what is hoped to be a decade-long series of actions undertaken by the Alliance to Involve Minorities in Mathematics. The following issues are discussed: (1) the high priority on mathematics education; (2) barriers to minority achievement; and (3) the roles that should be played by schools, higher education, professional organizations, parents and community groups, the media, business and industry, and government. Included is a list of National Convocation presenters and participants. (CW)

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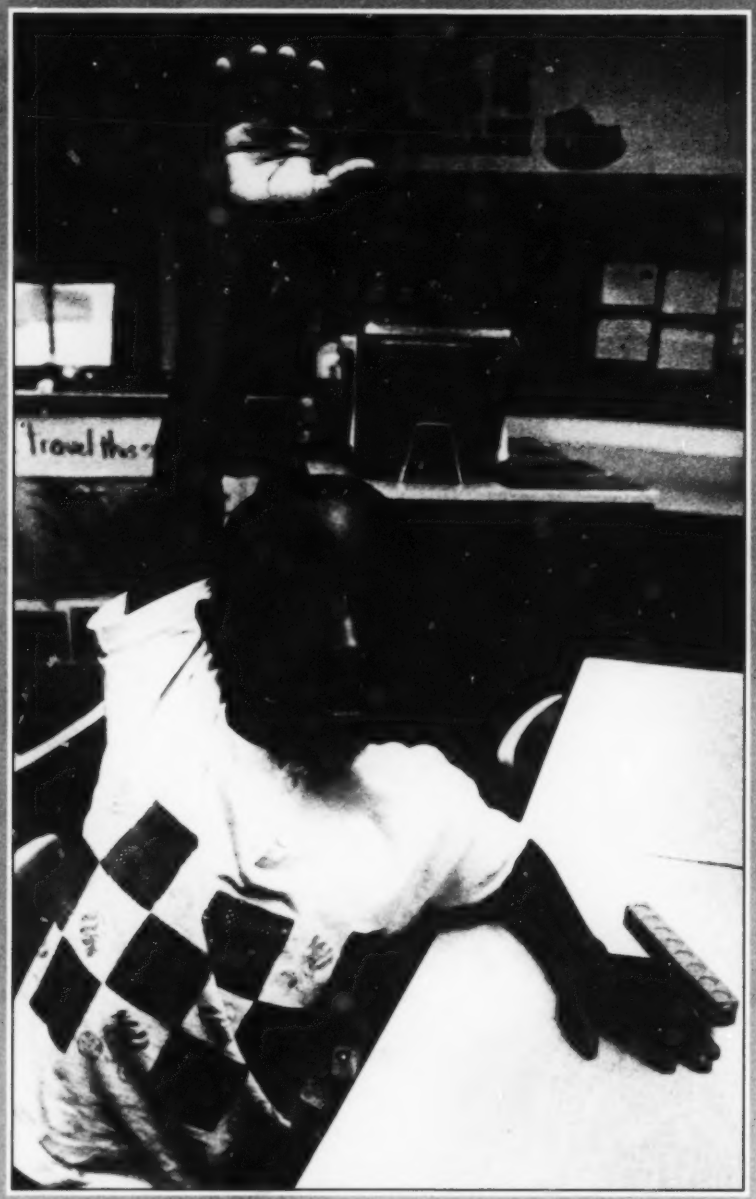
MAKING MATHEMATICS WORK FOR MINORITIES

FRAMEWORK FOR A NATIONAL ACTION PLAN 1990-2000



REPORT OF A CONVOCATION

MATHEMATICAL SCIENCES EDUCATION BOARD

NATIONAL ACADEMY OF SCIENCES ■ NATIONAL ACADEMY OF ENGINEERING
INSTITUTE OF MEDICINE ■ NATIONAL RESEARCH COUNCIL

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This document outlines a National Action Plan designed to make mathematics work for minorities. The directions charted here are a direct result of the completion of Phase I of the **Making Mathematics Work for Minorities** project of the Mathematical Sciences Education Board (MSEB). This outline is a reflection of the collective wisdom and deliberations of some 1,200 Americans, representative of nine constituent groups—schools, institutions of higher education, professional organizations, community and parental organizations, business and industry, government, and the media—at six regional meetings and at a National Convocation held on May 3 and 4, 1990, at the National Academy of Sciences in Washington, D.C. This framework now forms the basis for what we hope will be a decade-long series of actions undertaken by the newly formed Alliance to Involve Minorities in Mathematics working in conjunction with the MSEB.

Regardless of your affiliation, we invite you to read this document and hope that you will be able to identify a role for yourself and your organization in meeting its challenging goals. Join us on the path as we complete and implement a National Action Plan that will benefit us all. ■

THE NATIONAL CONVOCATION

"A self-fulfilling prophecy has been created and nurtured which asserts that minorities and women can't do mathematics and, therefore, that we should not expect much from these groups. Low expectations produce low achievement, and low achievement, in turn, tends to serve as a justification for low expectations, which produces a continuous, vicious cycle."

—J. Arthur Jones,
President, Futura Technologies, Steering Committee Chair, Making Mathematics Work for Minorities

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Placing a High Priority on Mathematics Education

—Frank Press,
President,
National Academy of
Sciences

"Making Mathematics Work for Minorities reflects two deep commitments we at the National Academy of Sciences and the National Academy of Engineering have: a commitment to all our youth, especially in mathematics and science, and a commitment to make mathematics and the sciences available to the underrepresented groups in our country to ensure the total education of all our citizens.

"Improving mathematics as a concern of our institution began in 1985 when we established the Mathematical Sciences Education Board, the sponsor of this event.

"Why do we put such high priority on mathematics? Because it is the foundation for science, engineering, management, and economics. It increasingly plays a major role in the financial and political decisions that affect our lives.

"Mathematics is important not just in the education of scientists, engineers, and economists but also in the education of every working citizen in the United States. It's hard to see how anybody can pull down anything better than a minimum wage job in the years ahead without quantitative skills. The world is changing, with an increasing emphasis on science and technology in every aspect of life: the service sector, the manufacturing sector, and so forth. Consequently, quantitative skills are prerequisites to enjoying a decent standard of living.

"This, of course, has special significance for women and minorities, groups that have traditionally been shut out of many technical jobs and careers because of weak mathematics preparation. Increasingly, these groups will be shut out of just about any job in the years ahead without an adequate basis, a foundation in mathematics. The nation as a whole has to be sensitive to this problem and raise its priority concern, because as demographics show, our workforce is changing. And increasingly, the nation will have to depend on the talents and the abilities of the traditionally underrepresented groups. Therefore, this is really an economic necessity for our nation.

"It is our job not only to discuss these issues with each other but also to reach out to all of our citizens and make these issues known.

"During the past year, the MSEB, with your help, has prepared for this convocation the beginnings of an action plan to move ahead on these issues. We're going to do our part in completing and implementing these plans, just as we know you will do yours." ■

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CHARGE TO THE NATIONAL CONVOCATION

"The presentation and refinement of 10-year plans at this convocation, and ultimately the implementation of those plans with the assistance of the Alliance to Involve Minorities in Mathematics, will have significant impact both nationally and internationally.

"We have come together at this national convocation from 34 states in the union. We have come to meet a challenge facing our nation. We are here to establish a new frontier in education for minority students.

"We have come to this national convocation in the belief that all students can and must learn mathematics. We are here to plan for the establishment of conditions under which minorities can perform optimally in mathematics. Equipped with the power of mathematics, these minorities will be prepared to assume the many jobs that await them.

"A monumental task confronts us. But we will be equal to it.

"We will move beyond constitutional and moral issues over the next couple of days and focus on demographic ones. We will move beyond just access and opportunity and establish an atmosphere that will make it possible for all students to truly learn mathematics. We will move beyond sympathy and seek ways to build minority self-esteem and confidence in the mathematics classroom and in the work place. We will move beyond simply asking for more money and figure out ways in which we can work smarter. We will move beyond apathy to help all families establish home environments to support their children's learning of mathematics.

"We will move beyond using mathematics merely as a tool to *control* the wealth in this country and move toward using education in mathematics to *protect* the wealth of this country. We will move beyond perpetuating negative cultural and educational stereotypes about Blacks, Hispanics, and American Indians to promote excellence for all students. We will decide upon the courses of action that should be taken by school systems; by colleges and universities, by teachers and professors; by parents and communities; by business, industry, and government; by legislators; by chief state school officers and school and college administrators; and by the media.

"The task is a huge one, but the goal is worth our investment. So, over the next couple of days, we must plan purposefully. We must succeed positively, and we must pursue our mission persistently. We will succeed, friends, because the time for this idea has come." ■

—Beverly J. Anderson,
Director of Minority Affairs, Mathematical Sciences Education Board

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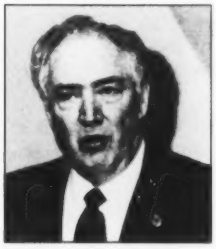
BARRIERS TO MINORITY ACHIEVEMENT



"Your efforts to make mathematics work for minorities and the forthcoming Alliance to Involve Minorities in Mathematics demonstrate that you (MSEB) are moving to seize this opportunity and to meet the challenge ahead of us in terms of mathematics and science. . . . We've made commitments as a nation before to take enormous steps. . . . We certainly can help extend the education of our children."

—The Honorable Lauro F. Cavazos,
Secretary, U.S. Department of Education

DEMOGRAPHIC REALITIES

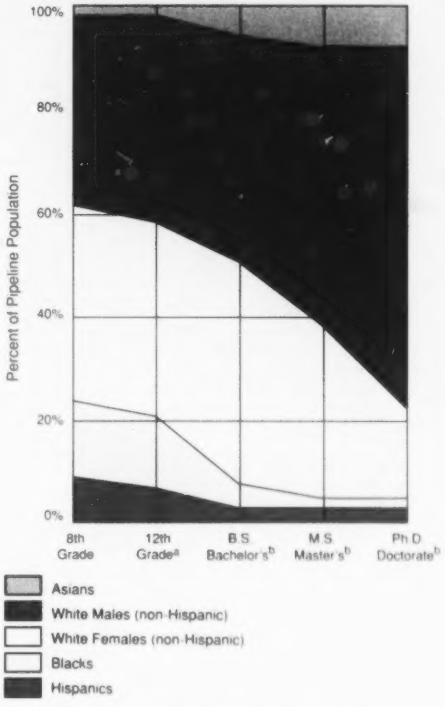
By the year 2000, one in every three American students will be a minority. Blacks, Hispanics, and American Indians comprise 90 percent of this nation's minorities.

Currently, Blacks make up 12 percent of the U.S. population, Hispanics 9 percent, and American Indians 0.6 percent. Yet their representation drops sharply among individuals with academic degrees in mathematics, science, and engineering. Blacks represent 5 percent of the holders of these bachelor's degrees, Hispanics 3 percent, and American Indians 0.3 percent; at the doctoral level the numbers are even worse—1 percent for Blacks, 2 percent for Hispanics, and 0.1 percent for American Indians.

Jobs requiring mathematical skills are growing at nearly double the rate of overall employment. In the past such jobs have been filled by white males. But by the year 2000 there will not be enough white males trained in mathematics to satisfy workforce demands. Women and minorities must fill these workforce gaps, or the United States will be unable to compete with technologically advanced countries in global markets.

The 10 largest school districts in the United States are 70 percent Black and Hispanic. Of the largest 25 city school districts in the nation, 22 are predominantly minority. Minority enrollment in the K-12 classrooms of 33 states is at least 20 percent.

Only six states have a minority student enrollment greater than 15 percent in their teacher education schools, colleges, and education departments. Out of every 400 students enrolled in teacher education programs nationally, there are 22 Blacks (5.5 percent), 7 Hispanics (1.75 percent), and 2 American Indians (0.5 percent).

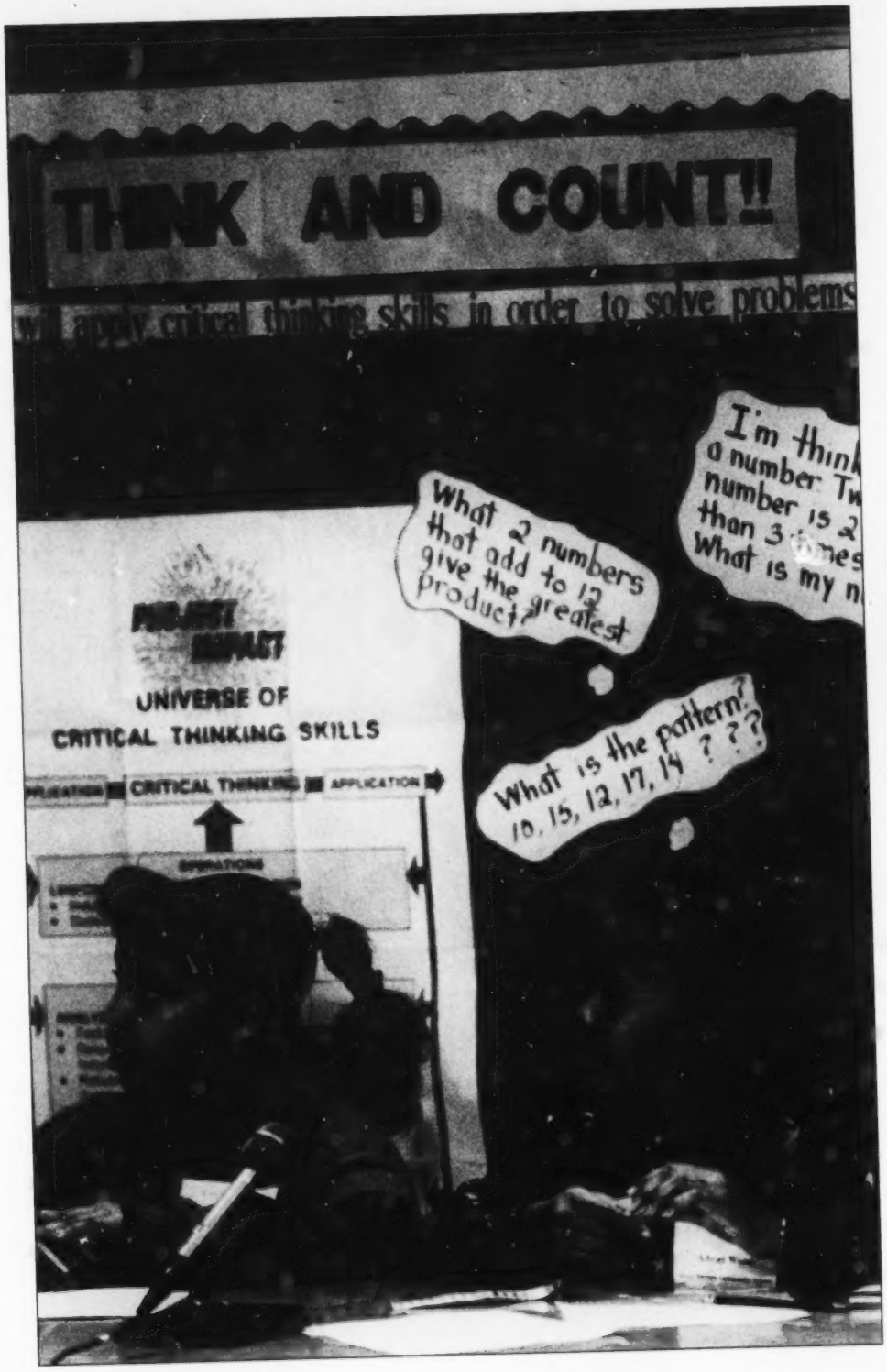


[a]High school record indicates possible choice of mathematics as a college major
[b]Degrees in mathematics

SOURCE: A Challenge of Numbers, National Academy Press, 1990

EDUCATIONAL REALITIES

- Students are turned off to mathematics in elementary school.
- Teachers often lack adequate preparation, support, and delivery mechanisms.
- The expectations from parents, teachers, and minority students, themselves, are low in mathematics.
- Lack of self-esteem and lack of self-confidence erode student interest.
- Inadequate early preparation prevents students in high school and college from taking mathematics courses.
- There are woefully few positive role models in mathematics, especially minority teachers.
- Many schools rely on tracking, a system that sorts students into achievers and underachievers and erodes mathematical desire.


THINK AND COUNT!!
UNIVERSE OF
CRITICAL THINKING SKILLS
CRITICAL THINKING
APPLICATION
What 2 numbers that add to 12 give the greatest product?
What is the pattern? 10, 15, 12, 17, 14 ? ? ?

"Generally, even those students who have fallen far behind in their mathematics achievement can close the gap between themselves and other students within a relatively brief time, if a high quality instructional program is offered to them."

***—Asa Hilliard**, Callaway Professor of Urban Education, Georgia State University*

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What Can and Should School Systems Do?

"I think what is missing in industry, as well as throughout the country, is the true realization that, indeed, we have a problem. America always reacts at the very last minute, but in this case it takes 28 years to grow a Ph.D., and we can't wait."

—Jaime Oaxaca,
Vice Chairman, Coronado Communications Corporation

Teachers

- Accept that the primary responsibility for revitalizing school mathematics rests with teachers.
- Increase the level of student participation in class.
- Create a classroom climate that is directed as well as friendly to all students.
- Incorporate teaching strategies and new assessment tools that develop reasoning skills in all students.
- Attend teacher institutes and summer programs that communicate strategies for teaching different types of students with varying learning styles and backgrounds.
- Insist on the development of activities aimed at understanding the factors that influence minority achievement.
- Become actively engaged in issues of teaching and learning.
- Nurture the expectation that *all* students can and must be given the opportunity to learn mathematics.
- Encourage parents to feel 'at home' in the classroom and to play a significant role in their children's education.
- Develop positive and productive school climates that facilitate students' learning of mathematics.
- Provide opportunities for students to improve their self esteem.
- Work to assure that administrators follow national curriculum developments; join with them to institute a core curriculum for all students that is based on national standards.

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ADMINISTRATORS

- Accept that the primary responsibility for revitalizing school mathematics rests with teachers.
- Design programs for principals and other administrators to encourage them to take a leadership role in involving more minorities in mathematics, science, and technology.
- Institute activities for teachers so that they become more aware of how behaviors toward minorities in the classroom impact student performance.
- Develop and implement programs that are consistent with national, state, and local education goals.
- Measure progress based on thinking skills as well as on mastery of basic skills.
- Encourage minority parents to feel at home in the schools and to play a significant role in their children's education.
- Develop positive and productive school climates that facilitate students' learning of mathematics.
- Eliminate low-end tracking while promoting a core curriculum in mathematics for all students.
- Provide opportunities for students to improve their self-esteem.
- Encourage business and industry to lend minority employees, especially those with advanced degrees in mathematics, to teach in schools
- Seek funding from the public/private sectors for after-school and weekend programs designed to strengthen minorities in mathematics.
- Support the national reform movement in mathematics assessment.

"The needed changes in mathematics education must be deliberate, well planned, fundamental, and broad based. Mathematics education in the future must emphasize a dynamic literacy centered on the application of mathematics to problem solving."

***—J. Jerome Harris**, Superintendent, Atlanta Public Schools*

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What Can and Should Institutions of Higher Education Do?

"On each campus we need to figure out what portion of our energy has been devoted to the larger professional issue and what portion has to be devoted to high schools. If not, there will be no mathematics in 10 or 15 years."

—Uri Treisman,
Director of the Charles A. Dana Center for Mathematics and Science Education, University of California, Berkeley

Improve Recruitment and Retention of Minority Students

- Identify and recruit potential mathematics and science majors among minority students in secondary schools and in the workforce.
- Increase the number of minority students who graduate with mathematics and science majors.
- Institute financial incentives to encourage minorities to pursue mathematics-based majors, including teaching.
- Make scholarships and financial aid available in ways that will attract minority students.
- Establish appropriate support programs to attract and retain minority students of mathematics, especially during the freshman year.
- Identify college programs that are helpful to minority students, and replicate or adapt such successful programs.
- Establish numerical targets for graduation of minority students majoring in mathematics and science, and measure progress toward those goals.
- Identify and recruit students for advanced degree programs in mathematics.
- Make a concerted effort to recruit minority faculty members, and provide opportunities for them to assume leadership roles in the faculty.
- Work with local school systems to ensure that institutional barriers to advanced education are eliminated.
- Encourage all components, such as 2-year and 4-year colleges, to work cooperatively with other institutions of higher education to encourage more students to seek baccalaureate and graduate degrees in mathematics-based fields.

Promote Improved Teaching Methods

- Accept that the primary responsibility for revitalizing undergraduate mathematics rests with college and university faculty.
- Launch a widespread and visible effort to eradicate erroneous beliefs that inhibit the performance of minorities in mathematics.
- Actively engage college and university faculty in issues of teaching and learning.
- Develop and adopt improved ways of teaching undergraduate mathematics.
- Increase the level of student participation in mathematics classes.
- Create a classroom climate that is friendly to all students.
- Develop strategies that actively involve students, and focus on the learning of reasoning skills rather than just on the acquisition of facts.

Commit More Resources

- Increase the allocation of resources in support of mathematics education for all students.
- Devise programs and working agreements to give minority school children and their parents regular contact with mathematics.
- Use the services of retired mathematicians and scientists.
- Serve as the center for regional and state mathematics networking.
- Encourage business and industry to lend minority employees, especially those with advanced degrees in mathematics, to teach in schools and colleges.

Improve Teacher Education Programs

- Follow national standards and recommendations that require strong mathematics content preparation for teachers at all levels.
- Institute preservice and in-service programs to emphasize the importance of motivating students, especially in the early grades, to view themselves as doers and learners of mathematics.
- Ensure that pre-service experiences are practical, that they are offered in diverse environments, and are under the direction of competent school teachers who teach to accommodate the needs of all students.
- Provide demonstrations on how to obtain high achievement with minorities.
- Work with state and local education boards to encourage more in-service training incentives for mathematics teachers.
- Provide continual sensitivity training to elementary and secondary school teachers and counselors, college and university faculty and advisors, and others who have direct contact with students.
- Work with local school systems to enhance teacher education programs, to develop academic intervention programs for students, and to plan in-service training programs for teachers.
- Use master teachers for laboratory experiences in student teaching and in-service staff development.

"I suggest that for any program in mathematics, science, or engineering education for minorities, a measurable outcome is: How many of those youngsters moved up to the next rung of the ladder as mathematics, science, or engineering majors. . . ?"

—David Sanchez,
Assistant Director, Mathematical and Physical Sciences, National Science Foundation

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What Can and Should Professional Organizations Do?

"Minority children, despite the fact that we are now 35 years since the Brown v. Board of Education *decision, are still by and large attending separate and unequal schools."*

***—Shirley McBay**, President, Quality Education for Minorities Network*

Reach Out to Members/Change Organizational Culture

- Make education a priority and become affiliated with education advocacy groups.
- Encourage and sponsor teacher and student attendance at mathematical and scientific professional meetings.
- Conduct organized efforts to change member attitudes about minority achievement.
- Use journals and newsletters as forums for articles and editorials about mathematics education reform.
- Develop speakers bureaus and mentor groups.

Adopt Policies Regarding Minority Participation

- Give visibility to minorities within each organization.
- Implement creative outreach programs that will encourage students to seek careers in mathematics-based fields.
- Institute outreach programs designed to increase minority membership and participation in professional organizations.

Conduct an Organizational Action Audit

- Review practices that impact minority involvement.
- Establish mentor programs to encourage minorities to pursue college degrees and professional careers.
- Play an active role in encouraging minorities to pursue the study of mathematics.

Work with Government to Bring About Change

- Encourage federal agencies to have scholarships or forgivable loans for students majoring in mathematics or mathematics education who teach for at least 5 years.
- Help negotiate incentives for industries that support programs aimed at demonstrably enhancing the education of minorities in the mathematical sciences.

Work with State Mathematics Coalitions

- Work to increase public awareness of the need for more minority participation in mathematics.
- Identify and expand good mathematics education programs, and adapt them to local needs.
- Support member involvement in state mathematics coalitions.

Network and Collaborate with Other Organizations

- Participate in the MSEB Alliance to Involve Minorities in Mathematics (AIMM).
- Offer demonstration or exhibit space to other AIMM organizations at annual meetings.
- Organize open presentations and discussions to share the views of speakers from other organizations with your members.
- Work to increase the membership and program effectiveness of AIMM.

Advocacy Activities for Parents and Community Groups

- Agree upon a set of goals for school mathematics achievement in each community.
- Work together to ensure that school budgets are adequate to meet the needs of all students.
- Encourage problem-oriented, hands-on math and science classes.
- Work together to establish rewards for positive academic performance.
- Work together to form coalitions to assist the schools.
- Communicate regularly with the schools, informally and through established groups (e.g., the PTA and School Boards of Education).
- Use churches and other institutions to establish tutorial and mentorship programs and information clearing-houses.
- Lobby to begin school mathematics in the early years and to make it a part of the curriculum every year through high school.
- Encourage local leaders to become advocates for mathematics education.
- Insist on "down time" from television at home.
- Host career conferences to bring students and industry personnel together.

Participation for Parents

- Become knowledgeable about school activities and programs.
- Provide positive role models for all students.
- Know school grading periods and discuss grades and expectations with your children.
- Become aware of the academic skills required at each grade level and monitor your children's progress.
- Learn how to lobby legislators and other policy makers.

Encouragement from Parents

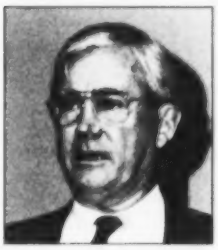
- Encourage children to study mathematics from preschool through high school and in college.
- Monitor and encourage good and consistent study habits, and provide the best possible study conditions.
- Provide tutorial help when necessary and possible.
- Buy gifts that support learning (calculators, puzzles, models, and so on).
- Urge children to attend school regularly.
- Support children's involvement in extracurricular activities, such as mathematics and science clubs, music, and so on.

What Can and Should Parents and Community Groups Do?

"To make mathematics work for minorities, we must develop mechanisms to show that mathematics can connect coherently across home, school, and community. We must create a system that will support learning, understanding, and appreciation of mathematics and its power in our lives. To make mathematics work for minorities, we must all get into the equation."

***—Shirley Malcom**, Head, Directorate for Education and Human Resources Programs, American Association for the Advancement of Science*

AIMM: Launching the Alliance to Involve Minorities in Mathematics



"The implementation of the effort on "Making Mathematics Work for Minorities" is going to be carried out by a new alliance to involve minorities in mathematics, and that will be a much larger activity. It will be results oriented."

—Alvin Trivelpiece
Chairman, Mathematical Sciences Education Board

". . .Our intention is to utilize the recommendations of each participant here to formulate what will eventually be the 10-year Action Plan. The idea for the formation of an alliance of organizations developed . . . because there was a strong need for coordinated action among several of the organizations involved."

—Kenneth Hoffman
Executive Director, Mathematical Sciences Education Board

"First and foremost, Secretary Watkins has asked us to undergo a process of cultural change. Open the doors of the labs, go out into the community, get the community into the labs. Let's see what we can do to become better partners."

—Peggy Dufour
Special Assistant to the Secretary, U. S. Department of Energy

"The NCTM, the largest organization of its kind in the world with a focus on mathematics curriculum and teaching, fully supports the concept of AIMM. To share our committed goal for the 1990's with you, . . . we pledge as a professional organization, and as individuals within that organization, that the Board of Directors of NCTM sees the comprehensive education of every child as its most compelling goal."

—Iris M. Carl
President, National Council of Teachers of Mathematics

"It is a near-consensus belief that unless America does a better job of training all of its students in math and science, it will, by the time of the turn of the century, have lost its place of advantage in the technological world. Let me reiterate that we support the initiatives proposed through the Alliance. The idea of bringing the considerable talents available in education, government, and industry together is an idea whose time has come."

—Rae Martel
Educational Affairs Division, National Aeronautics and Space Administration

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"...Communication, coordination, and collaboration are some of the functions we see the alliance becoming involved in. We think it's also important that the Alliance serve as a forum to move outside of the math community."

—Bobby Junker
Mathematical and Physical Sciences Directorate, Office of Naval Research

"The National Security Agency is perhaps the largest employer of mathematicians in the free world, but less than 2 percent of the mathematicians in our agency are minorities. . . . We want NSA to be an employment target for these bright mathematicians throughout their educational lives."

—George Cotter
Chief Scientist, National Security Agency

"I am pleased to announce that the Mathematical Association of America is launching a comprehensive program for minorities. . . called SUMMA, 'Strengthening Underrepresented Minority Mathematics Achievement.' The MAA will launch a multifaceted program to attract minorities into mathematics teaching at all educational levels . . . ."

—Marcia P. Sward
Executive Director, Mathematical Association of America

"When we extrapolate from recent trends, we can only forecast catastrophe. The National Association for Equal Opportunity in Higher Education hopes to be part of this alliance in order to work not only on identifying the problems but in solving the problems in mathematics."

—Samuel Myers
President, National Association for Equal Opportunity in Higher Education

"We, in fact, were created with a specific mission, which was to apply the power of the mass media to the educational needs of America's children, particularly minority children and children at risk of all races and ethnicities. . . . We look forward to a fruitful and mutual collaboration with the Alliance."

—David Britt
President, Children's Television Workshop

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Initial AIMM Organizations

American Federation of Teachers

American Indian Science and Engineering Society

American Mathematical Association of Two-Year Colleges

Benjamin Banneker Association

California State University System

Charles A. Dana Center for Mathematics and Science Education

Children's Television Workshop

Council of Chief State School Officers

Education Commission of the States

Exxon Education Foundation

KCET-TV Educational Enterprises, Inc.

Mathematical Association of America

Mexican American Engineering Society

National Action Council for Minorities in Engineering

National Aeronautics and Space Administration

National Alliance of Black School Educators

National Association for Equal Opportunity in Higher Education

National Association of Mathematicians

National Association of State Boards of Education

National Council of Negro Women

National Council of Teachers of Mathematics

National Education Association

National Governors Association

National Parent-Teacher Association

National School Boards Association

National Security Agency

Office of Naval Research, Department of the U.S. Navy

Project QUASAR

Quality Education for Minorities Network

Society for the Advancement of Chicanos and Native Americans in Science

Society of Hispanic Professional Engineers

The Links Foundation, Incorporated

United Indians of All Tribes Foundation

U.S. Department of Education

U.S. Department of Energy

U.S. Department of Housing and Urban Development

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Position Mathematics Education

- Design creative approaches to describe mathematics so that it will be a more attractive area for students.
- Publicize the many examples of success in teaching mathematics to minority students at all grade levels.
- Produce messages to communicate the urgency of this problem and to reverse the false stereotype that minorities cannot learn mathematics.
- Televise a series of "town meetings" in communities to discuss the meaning and impact of mathematics education reform.
- Develop programming aimed at educating parents about the mathematics skills needed for their children's access to jobs in a technological society.

Advise on the Development of Materials

- Provide volunteers to help produce radio scripts, audio and videotapes, and resource guides featuring excellent teachers and educational programs.
- Work with local representatives to produce guidelines for writing editorials and columns and for producing cable television programs.

Work Collaboratively with Other Constituencies

- Work cooperatively with ongoing programs and activities, such as SQUARE ONE TV and AIMM, to promote national and local educational successes on television and radio and in print media.
- Bring editors, publishers, and editorial boards together with educators to explore ways to communicate critical messages about mathematics education.
- Determine new mechanisms for giving exposure to the achievements of minorities in mathematics—both students and mentors—who can serve as role models.
- Help other groups to establish collaborative relationships with national advertisers in order to reach larger audiences with critical messages about mathematics education.
- Maintain dialogues among educators, members of the mathematics community, and the media in order to become more aware of the issues and to work together on public awareness solutions.
- Assign education reporters to cover and report the activities of professional and community organizations involved in local and national issues relating to minorities in mathematics.

What Can and Should the Media Do?

"School systems need to do what the corporate world has done: declare bankruptcy and ask the federal government to bail them out. Let us follow the lead of the savings and loan people and the Chrysler Corporation. . . . Solutions to our problems are going to take a lot of money."

—Robert Eaglestaff
American Indian Heritage School

What Can and Should Business and Industry Do?

Commit Resources

- Sponsor mathematics mentoring programs for students.
- Provide funding for a national clearinghouse for the purpose of disseminating information on effective educational activities.
- Allocate a portion of public relations budgets to communicate messages about our technological needs.

Communicate Issues

- Clarify and present information to other business leaders on pivotal education issues such as teacher training, curriculum, and assessment.
- Communicate the variety of mathematical skills students need to compete in the workforce.
- Provide students and parents with career information, and help them to see the connection between mathematics, future salaries, and career choices.
- Mobilize employees and staff to help disseminate information about national goals and mathematics education reform.
- Involve corporate representatives in giving congressional testimony on mathematics education reform initiatives.

Participate in Collaboratives

- Become a part of state mathematics coalitions and work with leaders in mathematics education, other business and industry leaders, parents, and legislators to facilitate more participation by minority groups in the mathematical sciences.
- Join and provide a representative to the MSEB's Corporate Council to work with AIMM members.
- Delineate the problems and challenges in mathematics education through a series of regional meetings and position papers.

Reverse Stereotypes

- Highlight the accomplishments of minorities in businesses that rely on mathematics.
- Establish a nationwide mentoring program involving minorities with mathematically based careers.
- Lend minority employees, especially those with advanced degrees in mathematics, to schools and colleges to teach.
- Develop initiatives aimed at educating parents about the mathematics skills needed for their children's access to jobs in a technological society.

"We (Exxon Education Foundation) have a deep interest in the work that's being done here to make mathematics work for minorities."

—Don Guertin
Executive Director, Exxon Education Foundation

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Local and State Government

- Expand efforts to attract and retain first-rate teachers.
- Establish governors' advisory groups to address issues of mathematics education.
- Direct a significant amount of education funding toward mathematics education in general and minority involvement specifically.
- Reward teachers and schools for outstanding efforts in developing minority students in mathematics.
- Fund valid (those who have a track record of success in working with minorities in mathematics) and massive teacher and staff development programs for schools and for higher education.
- Become actively involved in state mathematics coalitions, and use those coalitions to communicate national goals and standards for mathematics education to local schools.
- Place top priority on developing new tools for assessing student performance.
- Challenge educators to eliminate ability grouping and tracking and to rely instead on practices such as peer tutoring, reciprocal teaching, and cooperative learning.
- Draft legislation and policy related to increasing minority participation in business, industry, and foundations.

Presidential and Gubernatorial Leadership

- Stress the importance of national leadership guiding local actions as an important philosophy for making significant changes in U.S. education.

Federal Agencies

- Establish a series of bimonthly briefing breakfasts, which rotate among the federal agencies, where bureaucrats can exchange information on their hiring and minority educational programs.
- Encourage the National Science Foundation and other government-sponsored agencies to establish teacher institutes for the purposes of enhancing teaching skills in mathematics, broadening teachers' knowledge of various related subject matter, and providing guidance in relevant minority issues.
- Work with other constituencies to develop initiatives aimed at educating parents about the mathematics skills needed for their children's access to jobs in a technological society.
- Identify and highlight programs that are successful in improving the performance of minorities in mathematics, and fund the replication or adaptation of those programs across the country.
- Call for the launching of a mass media campaign to inform the general public about the importance of mathematics education for all Americans.
- Move to accomplish the strategic objectives set forth in the areas of improved science and mathematics performance, a strong precollege teacher workforce, increased participation of underrepresented groups, and improved public science literacy.

U.S. Congress

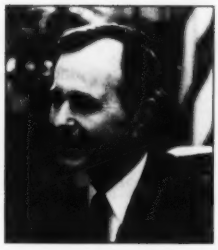
- Hear testimony and work with key committees to draft legislation that supports the activities called for by major education groups.
- Negotiate incentives for groups that support programs aimed at educating minorities in the mathematical sciences.

What Can and Should Government Do?

"We can make mathematics come alive and reform the presently unacceptable half-life for studying mathematics. . . . We want to be leaders in accomplishing change and by ensuring that minorities are an integral part of the scientific and technical enterprises in this country."

—Luther Williams,
Assistant Director, Education and Human Resources, National Science Foundation

BY THE YEAR 2000 ...



"By the year 2000, U.S. students must be first in the world in math and science achievement."

—President George Bush
State of the Union Address, January 31, 1990

An alliance now exists to spearhead the decade-long project echoing President Bush's call for mathematical and scientific excellence. The Alliance to Involve Minorities in Mathematics (AIMM) is a consortium of supportive organizations dedicated to bringing about effective, long-lasting changes in mathematics and science education. It is structured to accommodate many different kinds of activities so that a mix of approaches will blend to accomplish this massive task. Moreover, AIMM is coordinated at the national level by the MSEB, a body whose sole purpose is the reform of mathematics education—reform that emphasizes the importance of local leadership interpreting and acting upon national goals.

The spirit of the 1990's is to facilitate the ability of groups to work together—to build coalitions and consensus so that critical goals, such as the reform of mathematics education, can be realized through the sharing of responsibility as well as the sharing of expertise.

A major commitment of money and energy by the constituencies highlighted in this Action Plan—schools, higher education, professional organizations, parent and community groups, the media, business and industry, and government—is required if mathematics is going to succeed for minority students and, in fact, for all students. This commitment should be similar to our 1960 drive to get to the moon, during which time resources were poured into science and mathematics education in support of that objective.

The actions summarized in this plan, coming from a wide and varied number of individuals representing all major constituent groups, must be enacted if we are to reach our goal of reestablishing the United States as a leader in mathematics education.

If individuals and members of groups feel they cannot participate in the coordinated reform of mathematics education, we increasingly risk a continuation of our current course toward failure. ■

As AIMM member **David Crippens** said in his address to a **Making Mathematics Work For Minorities** regional meeting:

"The term 'social capital'. . . refers to the interconnected web of social relationships between people which facilitate learning and productive activity. This includes one's relationship with teachers, family members, friends, co-workers, and countless others whom a person encounters throughout the community.

"In contemporary American society, the bulk of the responsibility for developing 'human capital' has been charged to the schools; we give them our children, and the schools fill them with all the skills and knowledge they'll need in the 'outside' world. Of course, I am grossly oversimplifying the situation, but for a point: Educators alone cannot do it. Educators alone cannot develop 'social capital.' They are but one part of a wider community that must share the commitment to developing the minds and abilities of our young people."

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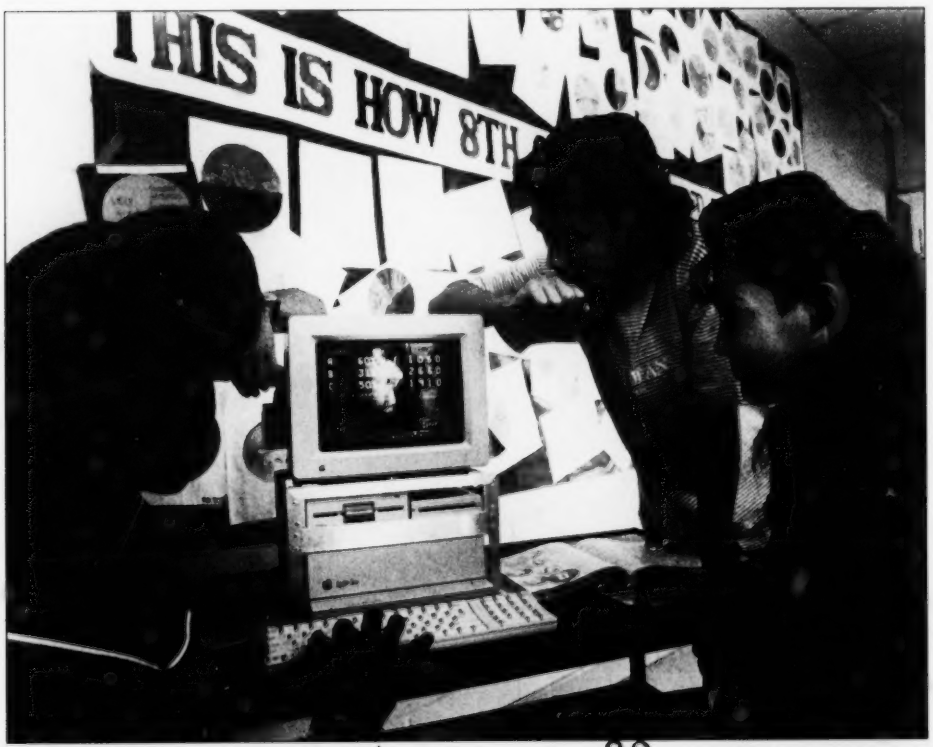
"I submit to you, then, that making mathematics work for minorities is not a problem just for minorities, but it is a problem for the nation. . . . They (minorities) are vital organs, and unless they are functioning, the body we call America cannot function."

—Charles W. Merideth
President, New York City Technical College



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